LISTING OF THE CLAIMS

This listing of claims, amended as indicated below, replaces all prior versions, and listings, of claims in the application

1. (Previously Presented) An energy-conversion system comprising:

an oxidant delivery system having an inlet and an outlet configured to deliver an oxidant-containing fluid into the energy-conversion system;

a fuel delivery system configured to deliver a fuel-containing fluid into the energy-conversion system;

a diluent delivery system configured to deliver diluent-containing fluid within the energy-conversion system, at least a portion of which comprises a vaporizable diluent fluid, and wherein at least a portion of diluent-containing fluid is pressurized as a liquid;

a combustion system, being configured to receive fluid from the fuel delivery system, the oxidant delivery system, and the diluent delivery system; and including a combustion chamber having at least one inlet in fluid communication with the outlet of the oxidant delivery system and with the outlet of the fuel delivery system; having at least one outlet, the combustion system being configured to mix fuel-containing fluid and oxidant-containing fluid to form a combustible mixture of fuel and oxidant, to oxidize fuel with oxidant, whereby forming products of oxidation, and to deliver at least a portion of liquid diluent-containing fluid into the combustion chamber; the combustion system being further configured:

to deliver and mix diluent-containing fluid with one or more of oxidant-containing fluid, fuel-containing fluid and products of oxidation;

to constrain the peak temperature of the energetic fluid exiting the combustion system; and

to form an energetic fluid within the combustion system comprising products of oxidation, and vaporized diluent fluid, the energetic fluid having elevated levels of one or more of: temperature, pressure and kinetic energy;

an expansion system comprising an expander having an inlet and an outlet configured to expand at least a portion of the energetic fluid, whereby forming an expanded fluid;

a heat and mass transfer system having a plurality of inlets and outlets, being configured to: recover heat from the expanded fluid whereby forming a cooled expanded fluid; provide heat to diluent-containing fluid whereby forming a heated diluent fluid; deliver at least a portion of heated diluent fluid to the combustion system;

a diluent recovery system configured to recover diluent from the expanded fluid at least about equal to that delivered into the oxidant fluid or energetic fluid upstream of the outlet of the expansion system; and to recover a portion of one or both of the water formed during combustion and the water delivered with the oxidant fluid into the oxidant delivery system; and

a fluid treatment system configured to remove at least a portion of water recovered from the expanded fluid, wherein removing a portion of at least one contaminant in the expanded fluid and wherein reducing the concentration of the contaminant in the energetic fluid entering the expansion system.

2. (Original) The energy-conversion system according to claim 1 wherein the cooled energetic fluid further comprises at least one minor pollutant species formed by reaction between two or more components of fuel-containing fluid, oxidant-containing fluid, and diluent-containing fluid; the energy-conversion system being configured to control the concentration of at least that one pollutant in the utilized fluid exiting the energy conversion system to less than a prescribed concentration.

3. (Original) The energy-conversion system of claim 2 further configured to control the rate of discharge of minor pollutant species to less than 1 kg per MWh of power generated.

4-9. (Canceled).

10. (Previously Presented) The energy-conversion system according to claim 1, wherein the transverse distribution of the ratio of actual exit temperature to desired exit temperature is controlled within a desired transverse ratio distribution, and wherein the temperature ratio is maintained within the range of 0.93 to 1.07.

11. (Previously Presented The energy-conversion system according to claim 10, wherein the temperature ratio is maintained within the range of 0.97 to 1.03.

12. (Previously Presented) The energy-conversion system according to claim 1, wherein the transverse distribution of the ratio of actual exit temperature to desired exit temperature is controlled within a desired transverse ratio distribution, and wherein the temperature ratio near the location of peak temperature is maintained within the range of 0.99 to 1.01.

13. (Previously Presented) The energy-conversion system according to claim 1, wherein the transverse distribution of the ratio of actual exit temperature to desired exit temperature is controlled within a desired transverse ratio distribution, and wherein the ratio of the temperature ratio near the periphery to the temperature ratio near the center is within the range of 1.00 to 1.06.

14. (Previously Presented) The energy-conversion system according to claim 1 wherein the flow uncertainty in the flows of fuel-containing fluid, diluent-containing fluid and oxidant-containing fluid are controlled within a selected magnitude thereby defining a temperature uncertainty, such that the peak temperature of the energetic fluid exiting the combustion system is within a selected number of temperature uncertainties below the designed peak temperature within a desired probability, thereby increasing the system efficiency.

15. (Canceled).

16. (Previously Presented) The energy-conversion system according to claim 1 wherein the oxidant delivery system further includes a fluid-pressurizing device configured to pressurize the oxidant-containing fluid, wherein the pressure ratio of the pressure entering the combustor to the ambient pressure is greater than about 20.

17. (Original) The energy-conversion system according to claim 16 further configured to cool the oxidant-containing fluid being compressed with diluent-containing fluid.

18. (Canceled)

19. (Currently Amended) The energy-conversion system according to claim ~~18~~ 232 further comprising a recompressor configured to compress the expanded fluid to at least ambient pressure and to exhaust it.

20. (Original) The energy-conversion system according to claim 19 wherein the recompressor is configured downstream of a diluent recover system.

21. (Original) The energy-conversion system according to claim 19 wherein the gross combined expansion ratio of the product of the pressure ratios of one or more fluid pressurizing devices compressing oxidant-containing fluid upstream of the combustion chamber and the pressure ratio of the recompressor compressing the cooled expanded fluid downstream of the diluent recovery system, is greater than about 37.

22. (Previously Presented) The energy-conversion system according to claim 21 wherein the ratio of mass flow of condensible diluent to mass flow of oxidant-containing fluid is controlled such that the net specific power of the energy conversion system relative to the total oxidant-containing fluid flow, comprising the gross power of the expander less the sum of the power utilized to compress the oxidant-containing fluid, fuel-containing fluid, and diluent fluid and cooled expanded fluid downstream of the diluent recovery system, is greater than 940 kW/(kg/s) (= kJ/kg) of fluid flow exiting the fluid pressurizing device compressing the oxidant-containing fluid wherein the oxidant is air.

23. (Previously Presented) The energy-conversion system according to claim 21 wherein the ratio of mass flow of condensible diluent to mass flow of oxidant-containing fluid is

controlled such that the net specific power of the energy conversion system relative to the expander flow, comprising the gross power of the expander less the sum of the power utilized to compress the oxidant-containing fluid, fuel-containing fluid, and diluent fluid and cooled expanded fluid downstream of the diluent recovery system, is greater than 700 kW/(kg/s) (=kJ/kg) of fluid flow entering the expander when operating on air.

24. (Previously Presented) The energy-conversion system according to claim 1 further including a recompression fluid pressurizing device compressing the cooled expanded fluid downstream of the diluent recovery system is configured to reduce the pressure of the cooled expanded fluid exiting the diluent recovery system to at least 1% less than the ambient pressure.

25. (Original) The energy conversion system of claim 24 wherein the recompressor is further configured to vary the recompression ratio of the ambient pressure to the pressure of the cooled expanded fluid.

26. (Original) The energy-conversion system according to claim 1 wherein the compression ratio of the fluid pressurizing device compressing the cooled expanded fluid downstream of the diluent recovery system is configured between 1.1 and 8.

27. (Original) The energy-conversion system according to claim 1 is further configured to control the ratio of condensible diluent to non-condensible gases in the energetic fluid, the ratio of temperature of the cooled expanded fluid to the ambient temperature, and the recompression ratio such that the concentration of diluent fluid in the fluid exiting the energy conversion system is less than a desired portion of the saturation concentration, whereby controlling the probability of a plume being formed.

28. (Previously Presented) The energy-conversion system according to claim 1 further comprising an expander having an inlet in fluid communication with the combustor, and

an outlet, configured to expand the energetic fluid from a higher pressure at the expander inlet to a lower pressure at the expander outlet.

29. (Previously Presented) The energy-conversion system according to claim 28 wherein the expander is a work engine configured to convert energy contained in the energetic fluid to useful mechanical power.

30. (Original) The energy-conversion system according to claim 28 wherein the fluid delivery and expansion ratio are configured and controlled such that the exit temperature of fluid exiting the expander is less than 500 degrees Celsius.

31. (Original) The energy-conversion system according to claim 28 further configured and configured to control the fluid delivery and expansion ratio such that the diluent concentration of the energetic fluid exiting the expander is less than the saturation concentration, whereby diluent does not condense within the expander.

32. (Previously Presented) The energy-conversion system according to claim 29 further comprising an electrical generator mechanically connected to the expander and configured to convert at least a portion of the mechanical power to electrical power.

33. (Previously Presented) The energy-conversion system according to claim 32 wherein the heat and mass transfer system further comprises a heat exchanger configured to recover heat from the electrical generator and transfer it to heat diluent-containing fluid.

34. (Original) The energy-conversion system according to claim 33 further configured to control the flow of diluent-containing fluid through the electrical generator heat exchanger and to maintain the temperature of the electrical generator below a desired level.

35. (Original) The energy-conversion system according to claim 33 further configured to use a low viscosity fluid to cool the electrical generator and exchange heat with the diluent-containing fluid.

36. (Original) The energy-conversion system according to claim 33 further configured to mix at least a portion of the heated diluent comprising heat from the electrical generator, with fluid upstream of the outlet of the expander.

37. (Previously Presented) The energy-conversion system according to claim 29 further comprising an expander drive connecting the expander to a mechanical application and wherein the heat and mass transfer system further comprises a heat exchanger configured to recover heat from the expander drive and deliver heated diluent-containing fluid.

38. (Previously Presented) The energy-conversion system according to claim 37 wherein the heat and mass transfer system is further configured to maintain the temperature of the drive lubricant to below a desired temperature.

39. (Previously Presented) The energy-conversion system according to claim 1 further comprising

a heat generating component consisting of one or more of a generator connected to the expander, a motor, an electromagnetic converter, and an electromagnetic controller; and

the heat and mass transfer system further comprising a component heat exchanger configured to control the flow of diluent-containing fluid wherein controlling the temperature of the heat generating component and recovering heat into heated diluent-containing fluid.

40. (Original) The energy-conversion system according to claim 39 further configured to control the flow of diluent-containing fluid such that the temperature of the electronic converter is maintained below 100 degrees Celsius.

41. (Original) The energy-conversion system according to claim 28 further comprising at least a second expander, configured to extract power from the energetic fluid at greater than 1.5 times the power extractable by the first expander at design conditions.

42. (Original) The energy-conversion system according to claim 1 wherein the controller is configured to control the fluid delivery such that the temperature of the energetic fluid entering the expander is controlled to not exceed a desired temperature.

43. (Previously Presented) The energy-conversion system according to claim 1 further comprising a fuel treatment system in fluid communication with the diluent delivery system, configured to treat the fuel-containing fluid and deliver it for use in the energy-conversion system.

44. (Previously Presented) The energy-conversion system according to claim 43 further comprising a cleaning means configured to remove at least a portion of contaminants in the fuel-containing fluid.

45. (Previously Presented) The energy-conversion system according to claim 44 further configured to filter off the contaminants from the fuel-containing fluid larger than a desired size.

46. (Previously Presented) The energy-conversion system according to claim 1 wherein heat from the expanded fluid downstream of the expander is exchanged with fuel-containing fluid being delivered to the combustion system.

47. (Previously Presented) The energy-conversion system according to claim 1 wherein the temperature of the fuel-containing fluid is maintained below a desired temperature prior to delivery into the combustion.

48. (Original) The energy-conversion system according to claim 47 the heat recovery is controlled such that the fuel-containing fluid temperature is maintained below about 100 degrees Celsius prior to delivery into the combustion system.

49. (Previously Presented) The energy-conversion system according to claim 1 further comprising a diluent treatment system in fluid communication with the diluent delivery system and configured to prepare the diluent for use in the energy-conversion system.

50. (Previously Presented) The energy-conversion system according to claim 49 further comprising a cleaning means configured to remove at least a portion of the contaminants from at least a portion of the diluent-containing fluid.

51. (Previously Presented) The energy-conversion system according to claim 50 further configured to filter off the contaminants larger than a desired size from at least a portion of the diluent-containing fluid.

52. (Previously Presented) The energy-conversion system according to claim 50 further configured to remove at least a portion of the soluble contaminants from the diluent-containing fluid.

53. (Previously Presented) The energy-conversion system according to claim 49 further configured to remove a portion of the recovered diluent from the energy conversion system.

54. (Previously Presented) The energy-conversion system according to claim 53 further configured to remove a portion of diluent from the energy conversion system whereby removing at least a portion of at least one contaminant from the energy conversion system, wherein maintaining the concentration of at least that contaminant entering the expander to less than a desired value.

55. (Previously Presented) The energy-conversion system according to claim 49 further configured to reduce a concentration of a diluent component to less than a desired value in at least a portion of diluent-containing fluid, wherein when at least a portion of that diluent is delivered upstream of the outlet of the expander, the concentration of that component in the energetic fluid delivered to the expander is less than a desired concentration.

56. (Original) The energy-conversion system according to claim 1 further configured to recycle a portion of the recovered diluent to upstream of the combustion system outlet.

57. (Original) The energy-conversion system according to claim 56 configured to reduce the portion of contaminants in a portion of the recovered diluent.

58. (Original) The energy-conversion system according to claim 57 further configured to sufficiently purify the diluent such that the total concentration of at least one contaminant in energetic fluid comprising that purified diluent recovered is less than a desired level.

59. (Original) The energy-conversion system according to claim 1 further comprising a diluent recovery system configured to recover a portion of diluent from the utilized fluid.

60. (Previously Presented) The energy-conversion system according to claim 59 further configured to control the portion of diluent removed from the energy conversion system wherein controlling the amount of diluent within the energy conversion system.

61. (Previously Presented) The energy-conversion system according to claim 59 further configured to recover a portion of diluent from the utilized fluid at least equal to the portion delivered upstream of the outlet of the expander.

62. (Previously Presented) The energy-conversion system according to claim 61 further configured to recover a portion of diluent equal to or greater than the portion of diluent delivered upstream of the outlet of the expander plus a portion desired to be removed from the energy conversion system.

63. (Original) The energy-conversion system according to claim 59 further configured to recover a portion of diluent from the utilized fluid to be equal to the portion deliverable upstream of the outlet of the expander plus a portion of diluent formable in combustion plus a portion of the relative humidity receivable through the incoming oxidant-containing fluid.

64. (Original) The energy-conversion system according to claim 1 configured to use water as a diluent in the diluent-containing fluid.

65. (Original) The energy-conversion system according to claim 1 wherein the diluent recovery system comprises a direct contact condenser.

66. (Previously Presented) The energy-conversion system according to claim 65 wherein an approach temperature difference between coolant fluid entering the diluent recovery system and cooled energetic fluid exiting the diluent recovery system is less than 20 K (36 Fahrenheit degrees).

67. (Previously Presented) The energy-conversion system according to claim 66 wherein the approach temperature is less than 4 K (7.2 Fahrenheit degrees).

68. (Original) The energy-conversion system according to claim 1 wherein the diluent recovery system further removes a portion of filterable contaminants from the cooled expanded energetic fluid.

69. (Original) The energy-conversion system according to claim 1 wherein the diluent recovery system further removes a portion of soluble contaminants from the cooled expanded energetic fluid.

70. (Previously Presented) The energy-conversion system according to claim 1 further including a first heat exchanger having a hotter inlet in fluid communication with the expander outlet, and a cooler outlet, to exchange heat between at least a portion of the expanded energetic fluid and at least a portion of diluent-containing fluid.

71. (Original) The energy-conversion system according to claim 70 wherein a portion of heated diluent is delivered to the combustion system.

72. (Canceled).

73. (Previously Presented) The energy-conversion system according to claim 1 wherein the diluent recovery system is configured to recover at least a desired portion of diluent from the expanded fluid exiting the expander.

74. (Previously Presented) The energy-conversion system according to claim 1 including a diluent recovery system in fluid communication with the outlet of the expander and configured to recycle at least a portion of recovered diluent fluid within the energy-conversion system.

75-77. (Canceled).

78. (Previously Presented) The energy-conversion system according to claim 1 wherein a portion of the diluent is mixed with fuel-containing fluid before the oxidation thereof.

79. (Previously Presented) The energy-conversion system according to claim 1 wherein a portion of the diluent is mixed with oxidant-containing fluid before oxidation of the fuel.

80. (Previously Presented) The energy-conversion system according to claim 70 further comprising a second heat exchanger downstream of the first heat exchanger to exchange heat of at least a portion of the energetic fluid with at least a portion of cooler diluent to cool the energetic fluid.

81. (Original) The energy-conversion system according to claim 1 wherein the heat and mass transfer system further comprises a second heat exchanger downstream of the first heat exchanger.

82. (Original) The energy-conversion system according to claim 81 wherein the heat and mass transfer system is configured such that the ratio of the area of the second heat exchanger to area of the first heat exchanger is in the range of 20% to 150%.

83. (Original) The energy-conversion system according to claim 81 wherein heat from the expanded fluid flowing through the second downstream heat exchanger is recovered by liquid diluent.

84. (Original) The energy-conversion system according to claim 81 wherein a portion of the liquid diluent heated in the second downstream heat exchanger is delivered to cool oxidant-containing fluid being compressed by the oxidant fluid pressure device.

85. (Previously Presented) The energy-conversion system according to claim 81 further comprising a device configured to control the flow rates of diluent-containing fluid being delivered from the second heat exchanger to the first heat exchanger and being delivered to the oxidant delivery system.

86. (Previously Presented) The energy-conversion system according to claim 81 further comprising a device configured to control the flow rates of diluent-containing fluid being delivered from the second heat exchanger to the intake to the oxidant delivery system and into compressed oxidant-containing fluid within the oxidant delivery system.

87. (Previously Presented) The energy-conversion system according to claim 1 wherein a portion of the flow of heated liquid diluent is delivered to an oxidant fluid pressurizing device in an amount less than or equal to that required to saturate the oxidant-containing fluid exiting the oxidant pressurizing device.

88. (Previously Presented) The energy-conversion system according to claim 70 wherein the heat and mass transfer system further comprises a condensation heat recovery system downstream of the first heat exchanger using a coolant fluid to recover heat from at least a portion of the energetic fluid sufficient to condense at least a portion of the vaporized diluent fluid.

89. (Previously Presented) The energy-conversion system according to claim 1 wherein the heat and mass transfer system further comprises a cooling system for coolant used to cool the expanded fluid and condense the vaporized diluent.

90. (Previously Presented) The energy-conversion system according to claim 88, wherein the condensation heat recovery system comprises a direct contact heat exchanger utilizing diluent as the coolant fluid.

91. (Previously Presented) The energy-conversion system according to claim 90 wherein the direct contact heat and mass transfer system and the coolant diluent flow are configured and controlled such that the approach temperature between the cooled utilized fluid exiting the direct contact heat exchanger and the heated coolant diluent is less than 4 degrees Celsius.

92. (Previously Presented) The energy-conversion system according to claim 80 wherein the heat and mass transfer system comprises a third heat exchanger downstream of the expander and upstream of the first heat exchanger to recover heat from the expanded fluid and to heat a coolant fluid.

93. (Previously Presented) The energy-conversion system according to claim 92 further comprising a device configured to control the flow rates of diluent-containing fluid being delivered from the first heat exchanger to the second heat exchanger and being delivered to the combustion system.

94. (Original) The energy-conversion system according to claim 92 wherein the coolant fluid comprises liquid thermal diluent and at least a portion of the thermal diluent is evaporated in the third heat exchanger.

95. (Original) The energy-conversion system according to claim 92 wherein the coolant fluid is thermal diluent and at least a portion of the thermal diluent is evaporated and further heated in the third heat exchanger to form a superheated diluent.

96. (Previously Presented) The energy-conversion system according to claim 92 wherein the oxidant delivery system comprises a compressor, and the coolant side of the third heat exchanger is in fluid communication with the combustion system downstream of the compressor and upstream of the expander.

97. (Previously Presented) The energy-conversion system according to claim 96 wherein diluent heated by the third heat exchanger is mixed with fluid within the combustion system downstream of the compressor and upstream of the expander.

98. (Original) The energy-conversion system according to claim 92 wherein diluent heated by the third heat exchanger is mixed with fluid upstream of the start of combustion.

99. (Previously Presented) The energy-conversion system according to claim 70 wherein the heat and mass transfer system further comprises a recuperative heat exchanger configured to recover heat from the expanded fluid exiting the expander and to heat oxidant-containing fluid upstream of the combustion system.

100. (Previously Presented) The energy-conversion system according to claim 99 wherein the heat and mass transfer system is configured such that the ratio of heat recovery surface areas of the recuperative heat exchanger to the first heat exchanger is from 20% to 300%.

101. (Previously Presented) The energy-conversion system according to claim 99 wherein the heat and mass transfer system is configured such that the portion of expanded fluid directed through the first heat exchanger downstream of the expander is similar to the portion of the expanded fluid directed through the recuperative heat exchanger heating oxidant-containing fluid upstream of the combustion system.

102. (Original) The system of claim 1 wherein the fluid treatment system further being configured to treat one or more of the diluent fluid, the fuel-containing fluid, and the oxidant-containing fluid to reduce the concentration of at least one component of the energetic fluid entering the expansion system.

103-220. (Canceled).

221. (Previously Presented) A method of controlling a heat and power system, the heat and power system comprising:

a reactant delivery system configured to deliver a reactant fluid comprising a reactant;

a co-reactant delivery system configured to deliver a co-reactant fluid comprising a co-reactant;

a diluent delivery system configured to deliver a diluent fluid comprising a vaporizable diluent;

a reactor configured to deliver diluent, react reactant with co-reactant and form an energetic fluid comprising reaction products, diluent and residual components of the co-reactant fluid and diluent fluid;

an expander configured to expand the energetic fluid and extract mechanical energy, whereby forming an expanded fluid;

a hot fluid heat exchanger configured to recover thermal energy from at least one of the energetic fluid and the expanded fluid, into a coolant fluid whereby forming a heated fluid and a cooled fluid;

a heated component heat exchanger, configured to control the temperature of a heated component of the heat and power system and recover heat into a coolant fluid;

a controller configured to control the delivery of reactant fluid, co-reactant fluid and diluent fluid;

the method comprising:

controlling the delivery of coolant fluid to the heated component heat exchanger wherein controlling the temperature of the heated component to less than a selected temperature;

controlling the diluent fluid delivered into the co-reactant containing fluid or energetic fluid upstream of the expander outlet, thereby controlling the peak temperature of the energetic fluid entering the expander to below a specified temperature;

controlling the delivery of coolant fluid through the hot fluid heat exchanger wherein recovering heat from the energetic fluid and

controlling the temperature of the heated fluid to be greater than a selected temperature;

controlling the reactant fluid delivery to provide a thermal energy at least equal to the thermal energy sufficient to deliver the sum of a mechanical energy extracted from the energetic fluid by the expander, plus a thermal energy extracted from the energetic fluid or expanded energetic fluid and delivered by the coolant fluid;

controlling one or both of the reactant fluid and the co-reactant fluid to obtain a ratio lambda of the co-reactant to reactant ratio relative to the stoichiometric co-reactant to reactant ratio within a selected range above one and below a selected ratio;

controlling diluent delivery within the reactor; wherein controlling the amount of oxides of nitrogen and amount of reactant pollutant components in the expanded fluid being exhausted from the energy conversion system.

222. (Original) The control method of claim 221 wherein the heated fluid comprises diluent.

223. (Original) The control method of claim 221 wherein the reactant is a fuel comprising one or more of hydrogen and carbon.

224. (Original) The control method of claim 221 wherein the co-reactant is an oxidant comprising one or more of oxygen, fluorine, chlorine, bromine, and iodine.

225. (Previously Presented) The temperature control method of claim 221 wherein the reactor is configured and able to deliver more diluent than the amount sufficient to saturate the co-reactant containing fluid.

226. (Previously Presented) The control method of claim 221 wherein the heated component receives heat from one of the energetic fluid and the expanded fluid, and comprises one or more of a component of the reactor, a component of the expander, and a heat exchanger.

227. (Original) The control method of claim 221 wherein the heated component comprises an internally heated component which generates heat, wherein the internally heated component comprises one or more of a generator, a motor, a bearing, a mechanical drive, an electromagnetic converter, and an electromagnetic controller.

228. (Previously Presented) The control method of claim 221 further comprising delivering heated diluent to cool a second heated component.

229. (Previously Presented) The control method of claim 221 further comprising delivering heated diluent to a heat application.

230. (Previously Presented) The control method of claim 221 further comprising delivering heated diluent to the reactor.

231. (Canceled).

232. (New) The energy-conversion system according to claim 80 further configured to deliver a portion of the heated diluent-containing fluid from the second heat exchanger into the oxidant-containing fluid being compressed.